

**Figure 1.** *Orobanche australiana* flower.

a : Flower bud at anther dehiscence stage

b : Open flower

c : Style/stigma in closed bud, showing placement of pollen (dots) - magnification x 10.

a - b: Scale bar = 15mm.

organ) were brought back to an insect proof growth cabinet, where the stored food reserves enabled flowering and fruit production to be completed, to demonstrate conclusively that the plants were self fertile, in all cases.

Open flowers of *Orobanche australiana* (Fig. 1,b) are relatively inconspicuous (being dull brown and purple in colour) and lack nectar or scent. No insect visits to a series of flowers observed irregularly for 18 hours over 18 days at Kings Park were recorded. However, since self pollination had already occurred such visits (unless made very shortly after flower opening, when self fertilization of all ovules may not have occurred, and some cross pollen could produce pollen tubes to fertilize some ovules) are probably superfluous.

Currently, these observations constitute a unique breeding system for a species of the genus *Orobanche*. Complementary studies on overseas species would be highly desirable. The author would also appreciate receiving whole live plants from any locality within Western Australia, to expand the distributional data and breeding system data on this unusual species.

#### REFERENCES

BECK-MANNAGETTA, M. 1930. *Orobanchaceae*. *Das Pflanzenreich* IV, 261: 1-348. Engleman. Leipzig.

JENSEN, H.W. 1951. The normal and parthenogenetic forms of *Orobanche uniflora* in Eastern United States. *Cellule* 54: 135-142.

KUIJIT, J. 1969. *The biology of parasitic flowering plants*. University of California Press. Berkley, California.

VISSER, J. 1981. *South African parasitic flowering plants*. Juta and Co. Cape Town.

#### A COMPARISON OF TWO CLIMBING PLANT SPECIES (ONE NATIVE AND ONE EXOTIC) AT WOODMAN POINT, WESTERN AUSTRALIA.

By JOHN FOX, School of Biology, Western Australian Institute of Technology, Bentley 6102.

#### ABSTRACT

The distribution of *Asparagus asparagoides* and *Clematis microphylla* at Woodman Point, Western Australia is discussed in relation to seed germination characteristics. *A. asparagoides* is able to establish faster at the same time of the year as *C. microphylla*; its seed is more viable and it can germinate at higher temperatures than *C. microphylla*.

## INTRODUCTION

An interesting aspect of the long-unburnt vegetation at Woodman Point is the large size attained by the native woody climbers of the area (Powell and Emberson 1981). During a survey of the vegetation undertaken in 1980 (Rye 1981) it became apparent that the flora contained a high proportion of exotic or naturalised alien species. Of some 97 species of plants noted in the area 26 are alien. This is a higher proportion than that for the Perth Region as a whole (Marchant and Perry 1981). *Asparagus asparagoides* (L.) Wight is a native of South Africa and appears to be particularly abundant at Woodman Point. It is a climbing member of the Liliaceae and occurs in the same habitats at Woodman Point as does the native *Clematis microphylla* DC. This paper presents some observations on these two species.

## SPECIES CHARACTERISTICS

*Clematis microphylla* (Ranunculaceae) is a native plant of southern Australia (Cunningham *et al.* 1981). It is a conspicuous plant of coastal dune vegetation near Perth, where it is often the only climber present. The petioles are able to twine tightly around stems of other plants. The plant reaches its full development as a surface covering over the crowns of shrubs and low trees. Old unburnt stems become corky and may attain a diameter of 4cm (Powell and Emberson 1981). Fruits develop in clusters as fluffy globular heads from which is derived the common name 'Old Man's Beard'. *C. microphylla* is also known as 'Small-leaved Clematis'. The fruitlets separate out when ripe and are dispersed by wind in summer. This species has been observed to grow back from root stock after fire.

*Asparagus asparagoides* (Liliaceae) is known as 'Bridal Creeper' or 'Smilax Asparagus' and is a native of South Africa. It has a lax climbing habit with an erect sinuous stem bearing branchlets. Five to seven (or more) alternate, ovate, glossy-green cladodes are borne on the branchlets. The main stem shifts direction at each branchlet node. Cladodes and branchlets then hang over the branches of other plants. The greenish white flowers develop into berries 7-10mm diameter which hang down in bead-like chains. The berries become dark red and sticky when ripe, and may be attractive to birds. There are several spherical black seeds to each berry. With the onset of hot weather cladodes dry off and are shed from the tip downwards. The plant develops an underground tuber.

## MATERIALS AND METHODS

A survey of the vegetation at Woodman Point made in 1980 included two associations with the species under consideration. These were *Acacia rostellifera* thickets and *Eucalyptus gomphocephala* woodland.

A set of randomly positioned 10 x 10m plots was used to sample the species present. All species present were counted in 1 x 1m subplots and crown projections were estimated. From these records values for frequency (presence in sub-plots), density (number of stems) and dominance (proportion of ground covered by the species' crown) were obtained. These data for 10 x 10 plots were then corrected to relative values such that the sum of each index for all species totalled 100. The relative values summed give an 'importance value index' (I.V.I.).

Seed of the two species was collected at Woodman Point in December 1979 and subjected to germination tests in controlled temperature cabinets between March and May 1980. Two additional tests were made with seed of *Asparagus asparagoides* between March and May 1982 using seed collected in November 1981. Each test involved a batch of 50 seeds placed on moist filter paper in a petri dish, with one dish in each of 10, 15, 20 and 25°C temperature cabinets maintained in darkness. The awn of *Clematis microphylla* was cut off before starting.

Seeds were surface sterilized in 3% 'Milton' solution prior to testing. Petri dishes were maintained in a moist condition, a 1% solution of 'Benlate' fungicide was used to combat any infection and daily records were made of new germinants for at least 60 days. A germinant was defined as a seed with 2mm of radicle protrusion.

## DISTRIBUTION AT WOODMAN POINT

Table 1 illustrates the status of the two climbers in live 10 x 10m plots at Woodman Point. The species were not recorded in other plots sampled. In the *Acacia rostellifera* thickets, parallel to the coast to the north of the area,

*Clematis microphylla* was much less frequent than the introduced *Asparagus asparagoides*. Here the latter species has been able to establish itself well. Some well-developed specimens reach several metres into the crowns of supporting host plants. A number of *A. asparagoides* individuals are usually found growing together, thereby deriving some mutual support.

By contrast, within the tuart woodland, *Clematis microphylla* was encountered more frequently than *Asparagus asparagoides*. Elsewhere at Woodman Point *A. asparagoides* is observed growing amongst *Callitris preissii*. The exotic is also found under dead tuart trees when the usual ground cover of *Lepidospermum gladiatum* and *Schoenus grandiflorus* is absent.

It may be speculated that the exotic species has established itself and persisted well in areas of a more open nature. The absence of fire in the tuart woodland area for some considerable time may have restricted the opportunities for *Asparagus asparagoides* to spread into the denser woodland.

**Table 1.** Ecological indices for *Asparagus asparagoides* and *Clematis microphylla*.

Location	Species	Relative Frequency	Values for Density	Dominance	IVI*
<u>Acacia thicket, northern coastal strip</u>					
1	<i>Asparagus asparagoides</i>	17.7	0.4	7.5	25.6
	<i>Clematis microphylla</i>	1.0	0.1	0.3	1.4
2	<i>Asparagus asparagoides</i>	19.0	0.3	1.8	21.1
3	<i>Asparagus asparagoides</i>	21.4	0.3	2.9	24.6
<u>Tuart woodland</u>					
1	<i>Asparagus asparagoides</i>	1.9	0.2	<0.1	2.1
	<i>Clematis microphylla</i>	8.6	0.5	4.9	14.0
2	<i>Asparagus asparagoides</i>	9.1	3.3	4.3	16.7
	<i>Clematis microphylla</i>	16.9	2.9	13.8	33.6

\* IVI = importance value index.

## GERMINATION BEHAVIOUR

The time course of cumulative germinations at 10, 15 and 20°C for all tests are illustrated in Figure 1. Table 2 contrasts germination percentages and times taken using the 1980 data only.

*Clematis microphylla* showed no viability at 25°C. The highest percentage germination was attained at 15°C where seed commenced germination earlier and germinated more rapidly. A period of 22 days was required from first moistening of seed until the first germination occurred, and a further 10 days before 50% of seed had germinated. The pattern of results for 10°C was not greatly different from that at 15°C, but at 20°C there was a prolonged period for the bulk to germinate and a lower total viability. The weighted mean days taken for final germination was 31-33 days for the two lower temperatures used.

The 1980 test with *Asparagus asparagoides* suggested that seed germinates strongly at all temperatures between 10 and 20°C and that seed has higher viability than *Clematis microphylla*. Fastest germination occurred at 15°C, but germination started sooner at higher temperatures where only 8 days was required after moistening the seed. As with *C. microphylla* germination was least successful at 25°C but some seed was viable at this temperature and germinated early. Half of the seed of *A. asparagoides* incubated at 10-20°C germinated within 16-19 days from moistening.

The 1982 test results with *A. asparagoides* at 10-20°C are illustrated in Figure 1. The patterns of germination at 15 and 20°C were similar to that for 1980. However very few seed germinated at 25°C, such that the mean for all three tests was 7.3% viability. Similarly at 10°C the 1982 tests were less successful



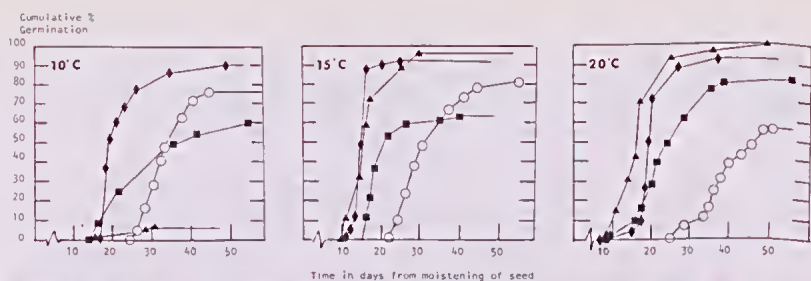


Figure 1. Time course of cumulative germination for *Clematis microphylla* (open circles) and *Asparagus asparagoides* (filled symbols) — 1979 seed (diamonds); 1981 seed (lot 1 squares; lot 2 triangles).

with an overall three test mean of 50.7% viability at this temperature and 48 days required for 50% germination. The best overall result was at 15°C with 15 days to 25% germination, 16 days to 50% and the mean days taken for final germination was 17.5.

Table 2. Germination values for *Clematis microphylla* and *Asparagus asparagoides* seed collected in December 1979.

	Cabinet Temperature (°C)			
	10	15	20	25
<i>Clematis microphylla</i>				
Days to first germination	25	22	26	—
Mean days to germinate 50%	30.0	26.6	37.2	—
Mean days to germinate final %	32.8	31.5	38.4	—
<i>Asparagus asparagoides</i>				
Days to first germination	18	12	8	8
Mean days to germinate 50%	18.3	14.4	17.8	—
Mean days to germinate final %	22	15.4	20	27.6

### IMPLICATIONS

In that *Asparagus asparagoides* occurs in habitats similar to those of *Clematis microphylla* it may be supposed that it is competing with the latter species. The optimum temperature range for germination of *Clematis microphylla* is lower than that for *A. asparagoides*. Germination of *A. asparagoides* is much more rapid than *Clematis microphylla* with 50% germination completed before the latter commences. A comparison of germination performance suggests that *A. asparagoides* is able to establish faster at the same time of the year as *C. microphylla*; that its seed is more viable, and that it can germinate readily at higher temperatures than can *C. microphylla*.

Both *A. asparagoides* and *C. microphylla* are perennials. *C. microphylla* individuals persist for many years. No new seedling growth of *C. microphylla* has been noted at Woodman Point. Clumps of germinating seedlings of *A. asparagoides* were observed in August (presumably from the previous year's seed). These were in the immediate vicinity of existing mature plants, suggesting that dispersal does not necessarily occur far removed from the parents. The life span of *A. asparagoides* is probably shorter than that of *C. microphylla* but the present distribution and abundance of the former at Woodman Point suggest that it would be difficult to eradicate it from the area.

### ACKNOWLEDGEMENTS

The following students assisted with germination tests: J. Berrisford, T. Bywaters, F. Swerrisen and A. Wedd. The late Mr Richard Ryan maintained the growth cabinets.

### REFERENCES

- CUNNINGHAM, G.M., MULHAM, W.E., MILTHORPE, P.L. and LEIGH, J.H. 1981. Plants of Western New South Wales. Government Printer, Sydney.
- MARCHANT, N.G. and PERRY, G. 1981. A checklist of the vascular plants of the Perth region, Western Australia. West. Aust. Herb. Res. Notes 5, 111-134.

POWELL, R. and EMBERSON, J. 1981. Woodman Point, A relic of Perth's Coastal Vegetation. Artlook, Perth.

RYE, P. 1981. Woodman Point, A Resource Reviewed. Environmental Studies Group, W.A. Institute of Technology, Bentley.

## NOTES ON DISTRIBUTION AND SEASONAL MOVEMENT OF THE STRIATED PARDALOTE IN WESTERN AUSTRALIA

By JOHN DELL, Department of Biological Survey, Western Australian Museum, Francis Street, Perth, W.A. 6000.

In Western Australia two subspecies of the Striated Pardalote, *Pardalotus striatus* (Gmelin), are currently recognised: *P. s. substriatus* Mathews which is distributed in the southern part of the State including the North West Division, and *P. s. uropygialis* Gould which occurs in the Kimberley Division. These subspecies (often recognised as separate species) are differentiated on plumage characteristics and breeding behaviour.

*P. s. substriatus* is generally assumed to be migratory. Sedgwick (1971) stated that in summer it was distributed in eucalypt forests and woodlands south of the Mulga-eucalypt line (Gardner 1942) but was not present in the northern wheatbelt. However, by May it was moving north and had reached the North West Division. Sedgwick (*ibid*) was able to locate few breeding data (October to December) and suggested that breeding may be confined to the South West, although J.R. Ford (in Sedgwick, *ibid*) considered it to be a migrant to the Great Victoria Desert where it stayed to breed during good seasons. Ford also postulated that the birds move into the Great Victoria Desert area from both southwestern Australia and from Eyre Peninsula, possibly crossing the Nullabor Plain.

In this paper I assess the above assumption on migration by synthesizing my published and unpublished data from southern Western Australia. Localities of data collection are indicated on Figure 1.

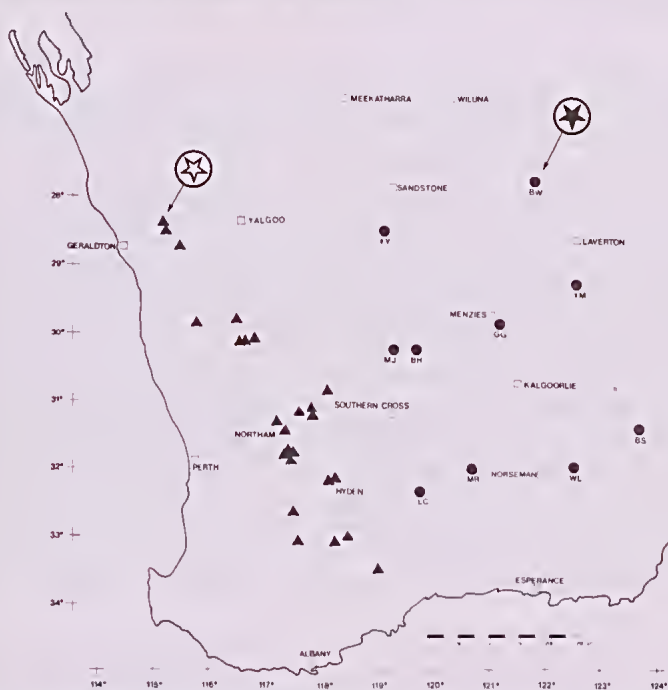


Figure 1. Map showing data collection localities in the Western Australian wheatbelt (triangles) and Eastern Goldfields (circles). Hollow star shows locality of East Yuna. Solid star indicates Banjarnaw Station where possible resident form of Striated Pardalote occurs.